

# Safety Data Sheet

## 3,3'-Dichloro- benzidine

Division of Safety  
National Institutes  
of Health



### WARNING!

THIS COMPOUND IS ABSORBED THROUGH THE SKIN AND THE RESPIRATORY AND INTESTINAL TRACTS. IT IS CARCINOGENIC. AVOID FORMATION AND BREATHING OF AEROSOLS.

LABORATORY OPERATIONS SHOULD BE CONDUCTED IN A FUME HOOD, GLOVE BOX, OR VENTILATED CABINET.

AVOID SKIN CONTACT: IF EXPOSED, WASH WITH SOAP AND WATER.

FOR EYE EXPOSURE, IRRIGATE IMMEDIATELY WITH LARGE AMOUNTS OF WATER. FOR INGESTION, DRINK WATER, INDUCE VOMITING, OR REFER FOR GASTRIC LAVAGE. FOR INHALATION, REMOVE VICTIM PROMPTLY TO CLEAN AIR. ADMINISTER RESCUE BREATHING IF NECESSARY. REFER TO PHYSICIAN.

IN CASE OF LABORATORY SPILL, WEAR PROTECTIVE CLOTHING DURING CLEANUP. AVOID SKIN CONTACT OR BREATHING OF AEROSOLS. USE ETHANOL TO DISSOLVE COMPOUND. WASH DOWN AREA WITH SOAP AND WATER. DISPOSE OF WASTE SOLUTIONS AND MATERIALS APPROPRIATELY.

### A. Background

3,3'-Dichlorobenzidine (DCB) has low toxicity in rodents. It is carcinogenic in rodents but its carcinogenicity in humans is uncertain. There is no evidence for mutagenicity or teratogenicity in animals, humans, or in vitro systems. DCB has commercial use in the synthesis of certain dyes and is used in the analysis of gold compounds.

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## Chemical and Physical Data

1. Chemical Abstract No.: 91-94-1

2. Synonyms:

DCB                                      o,o'-Dichlorobenzidine

C.I. 23060                              4,4'-Diamino-3,3'-dichlorobiphenyl

3,3'-Dichloro-4,4'-biphenyldiamine

3,3'-Dichlorobiphenyl-4,4'-diamine

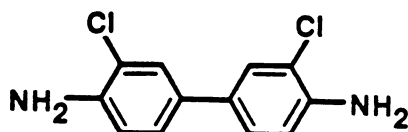
3,3'-Dichloro-4,4'-diaminobiphenyl

3,3'-Dichloro-[1,1'-biphenyl]-4,4'-diamine (9CI)

3. Molecular  
formula:

$C_{12}H_{10}Cl_2N_2$

structure:



weight:

253.14

4. Density: No data.

5. Absorption spectroscopy: UV and IR spectra are described by Grasselli and Ritchey (1975).

6. Volatility: No data.

7. Solubility: Very slightly soluble in cold water; readily soluble in ethanol, benzene, glacial acetic acid; slightly soluble in dilute hydrochloric acid.

8. Description, appearance, and odor: Colorless needles with slight amine-like odor.

9. Boiling point: No data.

Melting point: 132-133°C.

10. Stability: No data.

11. Chemical reactivity: DCB exhibits the usual reactivity of primary aromatic amines (salt formation, acylation, alkylation, isocyanide formation, tetrazotization, oxidation by neutral and basic permanganate) and of aromatic compounds in general (ring substitution).

13. Autoignition temperature: No data.

14. Explosive limits in air: No data.

#### Fire, Explosion, and Reactivity Hazard Data

1. DCB does not require special fire-fighting procedures or equipment and does not present unusual fire and explosion hazards.
2. No conditions contributing to instability are known to exist. While aromatic amines in general are slightly flammable, DCB does not evolve flammable vapors at 200°C.
3. No incompatibilities are known.
4. DCB does not require nonspark equipment. When handled in flammable solvents, the precautions required for such solvents apply.

#### Operational Procedures

The NIH Guidelines for the Laboratory Use of Chemical Carcinogens describe operational practices to be followed when potentially carcinogenic chemicals are used in NIH laboratories. The Guidelines should be consulted to identify the proper use conditions required and specific controls to be implemented during normal and complex operations or manipulations involving DCB.

1. Chemical inactivation: No validated method reported.
2. Decontamination: Turn off equipment that could be affected by DCB or the materials used for cleanup. Call the NIH Fire Department (dial 116) for assistance. Wipe surfaces with ethanol, then wash with copious quantities of water. Glassware should be rinsed (in a hood) with ethanol, followed by soap and water. Animal cages should be washed with water.
3. Disposal: No waste streams containing DCB shall be disposed of in sinks or general refuse. Surplus DCB or chemical waste streams contaminated with DCB shall be handled as hazardous chemical waste and disposed of in accordance with the NIH chemical waste disposal system. Nonchemical waste (e.g., animal carcasses and bedding) containing DCB shall be handled and packaged for incineration in accordance with the NIH medical-pathological waste disposal system. Potentially infectious waste (e.g., tissue cultures) containing DCB shall be disinfected by heat using a standard autoclave treatment and packaged for incineration, as above. Burnable waste (e.g., absorbent bench top liners) minimally contaminated with DCB shall be handled as potentially infectious waste and packaged for incineration, as above. Absorbent materials (e.g., associated with spill cleanup) grossly contaminated shall be

handled in accordance with the chemical waste disposal system. Radioactive waste containing DCB shall be handled in accordance with the NIH radioactive waste disposal system.

4. Storage: Store in glass ampoules or in amber screw-capped bottles with Teflon cap liners, preferably under refrigeration.

#### Monitoring and Measurement Procedures Including Direct Field Measurements and Sampling for Subsequent Laboratory Analysis

1. Sampling: For airborne particles smaller than  $0.3\ \mu\text{m}$ , impingers or bubblers filled with dilute hydrochloric acid are used. For larger particles, a high-volume air sampler with a fiberglass filter trap can be used. For surface sampling, cotton applicators moistened with an aqueous buffer are employed, and identification is made by spectrophotofluorimetry or colorimetric spot tests. Techniques for sampling metal, painted, and concrete surfaces have been reported (Weeks et al., 1976).
2. Separation and analysis: A colorimetric procedure, using the reagent chloramine-T, has been used for the determination of DCB in various media at concentrations as low as 20 ppb (Glassman and Meigs, 1951). TLC has been used for analysis of DCB in the workplace (Ghetti et al., 1968). More specific methods are GC or spectrophotofluorimetry, which are in common use for aromatic amines, although no specific application to DCB has been reported.

#### Biological Effects (Animal and Human)

1. Absorption: DCB may be absorbed by animals and humans by inhalation, by ingestion, and through the skin. It also crosses the placenta of pregnant rats.
2. Distribution: Very few data. Ten percent of an intraperitoneal dose in rats is found in liver, spleen, and carcass (Sciarini and Meigs, 1961).
3. Metabolism and excretion: Apparently very little, if any, metabolism of DCB occurs in animals and humans; 90% of an oral dose is excreted in the feces of dogs, with no urinary metabolites evident (Sciarini and Meigs, 1961). The same appears to apply to humans. Intravenous injection into rats, dogs, and monkeys likewise results in rapid elimination (almost completely via the feces) of most of the DCB in a few hours and in complete elimination within 7 days (Kellner et al., 1973).
4. Toxic effects: The acute oral LD50 of DCB is 4.74 g/kg in rats. Because of this low toxicity, target organs have not been established. In occupational exposures, methemoglobinemia may occur; dermatitis has been noted and this may indicate skin sensitization (Gerarde and Gerarde, 1974).

5. **Carcinogenic effects:** In contrast to benzidine and 4-aminobiphenyl, DCB does not produce bladder tumors in workers exposed to it (MacIntyre, 1975). Liver and bladder tumors have been reported after high chronic doses in mice and hamsters, respectively, in addition to local tumors at the site of application. It therefore appears that DCB is handled metabolically by different pathways in humans and other mammals.
6. **Mutagenic and teratogenic effects:** There are no data concerning mutagenicity of DCB. Subcutaneous DCB in pregnant mice increases tumor frequency in the offspring, and changes are found in embryonic mouse kidney in tissue culture upon exposure to DCB.

### Emergency Treatment

1. **Skin and eye exposure:** For skin exposure, remove contaminated clothing and wash skin with soap and water. For eye exposure, irrigate immediately with copious quantities of running water for at least 15 minutes. Consider ophthalmological consultation.
2. **Ingestion:** Drink plenty of water. Induce vomiting or refer for gastric lavage.
3. **Inhalation:** Remove victim promptly to clean air. Administer rescue breathing if necessary.
4. **Refer to physician.** Oxygen may be necessary during transport. Observe for methemoglobinemia.

### References

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